

## SEVERE STORMS.

Aside from the high winds accompanying the low pressure areas over the Great Lakes and along the north Atlantic and north Pacific coasts there were few damaging high winds.

Near Port Arthur, Tex., a severe wind storm on the 26th caused the death of one person and damaged prop-

erty to the extent of about \$100,000; and on the same date high winds at Seattle and Tacoma caused local damage to shipping, electric wires, and plate-glass windows, and high winds on the same date along the Washington coast caused the loss of two vessels and most of their crews.

## STORMS AND WARNINGS—WEATHER AND CROPS.

## STORMS AND WEATHER WARNINGS.

EDWARD H. BOWIE, Supervising Forecaster.

[Washington, Dec. 30, 1920.]

## WASHINGTON FORECAST DISTRICT.

The month from a meteorological standpoint was one of great activity, and more than the usual number of warnings of destructive winds on the Great Lakes and the seacoasts and of cold-wave and special warnings were required and issued. Moreover, the usual forecasts of the general weather and temperature conditions for a week in advance were issued each Saturday morning and distributed through the press associations and from weather bureau stations.

As has been the usual practice, heretofore, a special forecast for election day, the first Tuesday in November, was issued. This forecast was made on Monday, the 1st, and given distribution through the press associations and also telegraphed to the chairmen of the national campaign committees and to the presidential candidates. The forecasts in this particular case were accurate in practically every detail and read as follows:

A disturbance of widespread influence is central this morning over Iowa and moving east-northeastward. It has been attended during the last 24 hours by general cloudiness and rains in the Gulf States, the Great Central Valleys, the region of the Great Lakes, New England, and New York; by rains and snows in the Plains States, Minnesota, northern Wisconsin, northern Michigan, extreme northeastern New York and Maine, and snows in the Rocky Mountain region. The snowfall was heavy in parts of South Dakota, Nebraska, and Wyoming. The western disturbance will advance east-northeastward and be attended by unsettled weather and rains Tuesday—election day—in the Atlantic States, the upper Ohio Valley, and the region of the Great Lakes, with some probability of snow in northern Michigan, Wisconsin, and Minnesota. The weather will be clearing and much colder Tuesday in the Gulf States, Tennessee, and the lower Ohio and central Mississippi Valleys. Fair, cool weather will prevail Tuesday over the Plains States, the Rocky Mountain States, and all far Western States.

Special forecasts of wind and weather were prepared and dispatched each day until the 18th for the guidance of the United States naval vessels *Beaver* and *Mallard* engaged on the salvage of the United States submarine *S-5* off Delaware Breakwater. On the 19th the United States *Beaver* radiographed: "Special daily weather reports to *Beaver* and *Mallard* may be discontinued; thanks for it." It was reported that salvage operations were suspended at this time and probably would not be resumed until the coming spring, when the weather conditions would be more quiet.

On November 16 the following telegram was received from the Rayston Water Power Co., Huntingdon, Pa.: "Could you hazard a rough guess as to total precipitation, Bedford County, Pa., Monday, Tuesday, Wednesday, and Thursday this week." It appears that the available water for running this plant was so low that the question presented itself of shutting down the plant or else using coal at a greatly increased cost of operation. At this time a storm was in the Southeastern States,

and it was forecast to move northward, so that assurance could be given that general rains were probable in the immediate future. The reply to this inquiry read: "Approximately 1 inch or more precipitation, including both rain and melted snow, in Bedford County Monday to Thursday." It is reported that the actual fall measured during this period was 1.25 inch.

Special flying forecasts were issued for Army and Navy aviators, and the usual daily forecasts of weather, wind at the surface and at flying levels, for the Army, Navy, and the Post Office Aerial Mail Service routes continued throughout the month.

## STORM WARNINGS ON THE GREAT LAKES.

Northeast storm warnings were continued on the 1st on Lake Superior, northern Lake Michigan, and northern Lake Huron, in connection with a disturbance that was central at noon of that day over northern Iowa, and the evening of the same day southwest storm warnings were ordered on southern Lake Michigan, southern Lake Huron, and Lake Erie. This disturbance advanced north-eastward attended by rain and snow and strong winds and gales on the Great Lakes. The highest velocity reported was 68 miles per hour from the southwest, at Buffalo. At 10 p. m. of the 3d, southwest storm warnings were displayed on Lake Superior and at 10 a. m., on the 4th, the display was extended over Lakes Erie, Ontario, and northern and eastern Huron. The disturbance making necessary this display was central the night of the 3d near Winnipeg, and the night of the 4th, over Ontario, strong westerly winds and gales occurred as forecast.

On the 8th, at 10 p. m., when a storm was central over Minnesota, northwest storm warnings were displayed on the upper Lakes and the morning of the 9th southwest storm warnings were hoisted on the lower Lakes. The storm under consideration moved rapidly eastward across the Great Lakes attended by strong westerly winds and gales during the 9th.

Northwest storm warnings were ordered at 10 a. m. of the 11th on eastern and central Lake Superior and Lakes Michigan and Huron, and at 3 p. m. of the same day the display of northwest storm warnings was extended to Lake Erie. Strong northwest winds attended by snows occurred during the ensuing 24 hours on these Lakes.

A storm of marked intensity was central at noon of the 16th over South Carolina, and increasing in intensity and moving northward. It was expected to gain great intensity during its continued northward movement, and at 2 p. m. northeast storm warnings were ordered for Lakes Erie and Ontario and at 9:30 p. m. the display was extended west to Lake Huron. The storm acted as expected, and during the night of the 16th and during the 17th strong winds and snow occurred on these Lakes.

A disturbance of moderate but increasing intensity was central the morning of the 20th over western Nebraska, and there were indications that it would move eastward and increase in intensity. Accordingly, northeast storm warnings were displayed at 10 a. m. of this date on Lake Superior, northern Lake Michigan, and northern Lake Huron. The storm moved as expected and increased greatly in intensity, and the morning of the 21st northwest storm warnings were displayed on southern Lake Huron and southern Lake Michigan and southwest storm warnings were displayed on the lower Lakes. This storm was particularly severe on extreme northern Lakes Michigan and Huron. At 9 a. m. of the 21st the displayman at Presque Isle Light reported a whole gale from north by east and terrific sea.

A disturbance of considerable intensity was central the morning of the 29th over western Missouri, and it was expected that it would move northeastward and increase greatly in intensity. Northeast storm warnings were then ordered for the upper Lakes. This disturbance did not gain the expected intensity, and at 10 p. m. the storm warnings were ordered lowered.

#### STORM WARNINGS ON THE EAST GULF COAST.

On the 15th, at 10 a. m., when the barometer was low and falling over the east Gulf and high and rising over the west Gulf States, northwest storm warnings were ordered for the east Gulf coast. The storm over the east Gulf increased greatly in intensity and moved northeastward and northerly gales prevailed over the Gulf during the night of the 15th and during the 16th.

Also on the evening of the 26th northeast storm warnings were displayed on the Mississippi, Alabama, and extreme northwest Florida coast, at which time a cyclone was central off the Texas coast. The winds increased during the night of the 26th and became of gale force along the coast where warnings were displayed.

#### STORM WARNINGS ON THE ATLANTIC COAST.

On the 2d, at 3 p. m., southwest storm warnings were displayed along the coast at and north of Cape Henry, when a disturbance was over the Great Lakes, increasing in intensity and moving eastward. During the night of the 2d south shifting to west gales occurred along the coast where warnings were displayed. The highest velocity reached was 68 miles per hour from the southwest at Nantucket, Mass.

On the 9th, at 10 p. m., northwest storm warnings were displayed on the coast at and between Delaware Breakwater and Portland, Me. The disturbance at that time being central over the St. Lawrence Valley; this storm passed rapidly eastward and although strong west and northwest winds attended it, no gales occurred on the coast where warnings were displayed.

On the afternoon of the 11th northeast storm warnings were displayed on the Middle Atlantic and New England coast, in anticipation of a northeastward movement and increase in intensity of a storm that was then central over Florida. Strong west and northwest winds and gales prevailed along these coasts on the 12th.

The afternoon of the 15th storm warnings were displayed at all points on the Atlantic coast at and south of Delaware Breakwater, at which time a disturbance was developing over Florida, and the morning of the 16th storm warnings were hoisted on the coast north of Delaware Breakwater, the warning reading as follows:

Hoist northeast storm warning 9:30 a. m. Cape May, N. J., to Eastport, Me. Southern storm increasing rapidly in intensity and moving northward, increasing northeast winds becoming gales with rain and probably snow off New England and Middle Atlantic coasts. Dangerous for all shipping.

This storm was of great severity during the night of the 16th and on the 17th north of Cape Hatteras.

Storm warnings were displayed the morning of the 22d Sandy Hook, N. J., to Eastport, Me., at which time a disturbance of considerable intensity was over Ohio. The warning of easterly gales was particularly applicable to the New England coast, destructive winds prevailing during the night of the 22d and on the 23d.

The last storm of the month for which warnings were required had its center at 8 p. m. of the 27th over southern Alabama and at 9:30 p. m. northeast storm warnings were displayed on the coast between Wilmington, N. C., and Boston, Mass. By the morning of the 28th gales had set in on the Middle Atlantic coast and the display of northeast storm warnings was extended north of Boston to Eastport, Me. During the 28th and 29th gales prevailed on the Middle Atlantic and southern New England coasts.

#### COLD WAVE AND FROST WARNINGS.

Cold wave warnings were issued on the 8th for the upper Lake region, Indiana, Kentucky, Tennessee and western Ohio and on the 9th for northern New England and extreme northern New York. Much colder weather followed over these regions.

Frost warnings were issued on a number of days for the Eastern and Southern States.

#### WARNINGS FROM OTHER DISTRICTS.

*Chicago forecast district.*—The month for the most part was rather mild, but a well marked cold spell covered the district for a week or more, beginning near the close of the first decade. This was in fact the only marked cold wave during the entire month and warnings were issued in advance for every station in the district except the northern Rocky Mountain region. The cold wave developed in the British Northwest on the 8th and moved steadily southeastward over the Chicago forecast district, reaching the eastern limits on the 10th. This wave was immediately followed by two others, so that the temperature remained continuously below the seasonal normal at all stations for more than a week.—*H. J. Cox.*

*New Orleans forecast district.*—Storm warnings were displayed on the Texas coast at Port Arthur and Galveston, including the Galveston section, November 12 and 26. Small-craft warnings were displayed on the Texas coast on the 11th and 15th, and on parts of the Texas, and Louisiana coast on the 26th. All warnings were justified and no general storm occurred without warning.

Cold-wave warnings were issued for the northern portion of the district at 9:30 a. m., November 9, and repeated for Arkansas and northern Louisiana at night. The area of low temperature moved southward so slowly the warnings were only partially verified. Frost and freezing warnings were issued for all injurious conditions. Freezing prevailed in the sugar and trucking region on the 13th and the 16th to 18th, inclusive, for which timely temperature warnings were issued and sugar cane was windrowed and saved from injury.

Fire-weather warnings were issued on the 8th, 9th, and 20th, and conditions occurred as forecast.—*I. M. Cline.*